

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

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| Applicant's or agent's file reference XA1778 | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416) | |
| International application No. PCT/GB 03/05507 | International filing date (day/month/year) 18.12.2003 | Priority date (day/month/year) 23.12.2002 |
| International Patent Classification (IPC) or both national classification and IPC G02B26/06 | | |
| Applicant BAE SYSTEMS PLC | | |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 8 sheets, including this cover sheet.
- ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
- These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:
- I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☒ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

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|---|--|
| Date of submission of the demand 19.07.2004 | Date of completion of this report 27.04.2005 |
| Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016 | Authorized Officer Quertemont, E Telephone No. +31 70 340-3078  |

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/GB 03/05507**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-11 as originally filed

Claims, Numbers

1-18 as originally filed

Drawings, Sheets

1-5 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).
- (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:
- ☐ the entire international application,
 - ☒ claims Nos. 17,18
- because:
- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):
 - ☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 17,18 are so unclear that no meaningful opinion could be formed (*specify*):
- see separate sheet**
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
 - ☐ no international search report has been established for the said claims Nos.
2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:
- ☐ the written form has not been furnished or does not comply with the Standard.
 - ☐ the computer readable form has not been furnished or does not comply with the Standard.

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees, the applicant has:
- ☐ restricted the claims.
 - ☐ paid additional fees.
 - ☐ paid additional fees under protest.
 - ☐ neither restricted nor paid additional fees.
2. ☒ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

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☐ complied with.

☒ not complied with for the following reasons:

see separate sheet

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

☐ all parts.

☒ the parts relating to claims Nos. 1-16 .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|-----------|
| Novelty (N) | Yes: Claims | 5,9-16 |
| | No: Claims | 1-4,6,7,8 |
| Inventive step (IS) | Yes: Claims | |
| | No: Claims | 1-16 |
| Industrial applicability (IA) | Yes: Claims | 1-16 |
| | No: Claims | |

2. Citations and explanations

see separate sheet

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

Non-establishment of opinion for claims 17 and 18 on the grounds of Rule 6.2(a) PCT.

Re Item IV

Lack of unity of invention

1. Reference is made to the following document :

D1 : Ikramov A. V. et al : "Bimorph adaptive mirror", Soviet Journal of Quantum Electronics, American Institute of Physics, Woodbury, NY, US, vol. 22, no. 2, 1 February 1992 (1992-02-01), pages 163-166.

2. The following features of claims 1-5,17,18 are disclosed in document D1 (see figures 1 and 2 and column 1, lines 19-45): a deformable mirror comprising a reflective element provided on a substrate that is secured to a deformable element, the substrate comprising a plurality of channels each having ports located around the peripheral edge of the substrate. The plurality of channels intersect to form a chamber. The channels extend radially to intersect at the centre of the substrate.
3. The feature of channels extending from a central portion of the substrate to the edge of the mirror in an offset arrangement, thereby intersecting to form a substantially ring-shaped chamber is not disclosed in the prior art document. The technical problem solved by this technical feature is how to minimize any temperature gradient that might otherwise develop between the input and output conduits because of difference in coolant temperature.
4. The claims 6-16 contain the following technical features not disclosed in the prior art document : the channels of the mirror and the mount being connected via flexible seals. The technical problem solved by these technical features is how to ensure that the water-tight seal formed between the mirror and the mount is not compromised by the deformation of the mirror.

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5. The technical features which are mentioned in paragraphs 3 and 4, above, as making a contribution over the prior art to the solution of the objective problem define the "special technical features" of the first and second invention, respectively, within the context of PCT Rule 13.2.
6. The above analysis shows that the special technical features of the first to second inventions are neither the same nor corresponding in the sense of Rule 13.2.
7. In addition, the objective problem related to the first and second inventions, seen in the light of the description of the application, shows that there is no technical correspondance between them.
8. Consequently the 2 groups of claims (claims 1-5 and 6-16, respectively) are not linked by a single general inventive concept as required by Rule 13.1 PCT nor do they involve the same or corresponding special technical features as required by Rule 13.2 PCT. The 2 groups of claims therefore correspond to 2 different inventions.

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents :

- D1: IKRAMOV A V ET AL: 'BIMORPH ADAPTIVE MIRROR' SOVIET JOURNAL OF QUANTUM ELECTRONICS, AMERICAN INSTITUTE OF PHYSICS. WOODBURY, NY, US, vol. 22, no. 2, 1 February 1992 (1992-02-01), pages 163-166, XP000273608
- D2: US-A-3 731 992 (MANSELL D) 8 May 1973 (1973-05-08)
- D3: US-A-4 674 848 (DAIGNEAULT STEVEN M ET AL) 23 June 1987 (1987-06-23)
- D4: US-B-6 307 6881 (BECKER JOCHEN ET AL) 23 October 2001 (2001-10-23)

- 2.1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT.
- 2.2 The document D1 discloses (figures 1, 2, 4 and column 1, lines 19-41 ; the references in parentheses applying to this document) a deformable mirror comprising a reflective element (2) provided on a substrate (3) that is secured to a deformable element (plates 4 and 5), wherein the substrate comprises at least one channel having a pair of ports both located around the peripheral edge of the substrate (see figures 2 and 4).
- 2.3 Hence the subject-matter of claim 1 is not new (Article 33(2) PCT).
- 2.4 The applicant should be aware that the subject-matter of claim 1 is also not new (Article 33(2) PCT) with respect to document D3 (figure 3).
- 3. The features of dependent claims 2-4 are also disclosed in D1 (see figure 2). Hence the subject-matter of claims 2-4 is not new (Article 33(2) PCT).
- 4. Document D2 (figure 1) discloses a liquid cooled mirror wherein the channels extend

from a central portion of the substrate to the edge of the mirror in an offset arrangement, thereby intersecting to form a substantially ring-shaped chamber. This feature is described (see D2, column 2, lines 39-42), as providing the same advantages as in the present application (improving the heat exchange by creating a turbulent flow). The skilled person would therefore regard it as a normal design option to include this feature in the deformable mirror described in D1 in order to solve the problem posed. Hence the subject-matter of claim 5 does not involve an inventive step (Article 33(3) PCT).

5. The subject-matter of dependent claim 6 is not new (Article 33(2) PCT). Document D3 discloses a deformable-mirror mount and a deformable mirror according to claim 1, wherein the mount has a body with a central aperture defined by a supporting surface sized and shaped to support the mirror when installed, and wherein the mount is provided with at least a pair of channels (42 and 45) that terminate to face the ports in the mirror (45) when the mirror is installed, the channels (45) of the mirror and the mount being connected via flexible seals (44a and 44b and column 4, lines 41-45).
6. The additional features of claims 7 and 8 are also disclosed in document D3 (figure 3). The subject-matter of claims 7 and 8 is therefore not new (Article 33(2) PCT).
7. Dependent claims 9-16 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect to inventive step. Document D4 (figures 1 and 2) discloses a deformable-mirror holder, wherein the aperture of the mount is defined by a plurality of flexible beams (3) having features of claim 9, the inclusion of such flexible beams in a structure comprising a deformable mirror such as in D1 would be an obvious possibility. The additional features of claims 10-16 do not appear to involve any further inventive step. Hence the subject-matter of claims 9-16 lacks an inventive step (Article 33(3) PCT).